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Lai et al.

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(54) **DISTRIBUTING NOTIFICATIONS TO MULTIPLE RECIPIENTS VIA A BROADCAST LIST**

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CPC ***G06Q 10/109*** (2013.01); ***G06F 21/335*** (2013.01); ***G06F 21/629*** (2013.01); ***G06F 21/6218*** (2013.01); ***G06F 21/6227*** (2013.01); ***G06F 21/6236*** (2013.01); ***G06F 21/6245*** (2013.01); ***G06F 21/6272*** (2013.01); ***H04L 29/06*** (2013.01); ***H04L 63/10*** (2013.01); ***H04L 63/102*** (2013.01); ***H04L 67/02*** (2013.01); ***H04L 67/16*** (2013.01); ***H04L 67/28*** (2013.01); ***H04L 67/2819*** (2013.01); ***H04L 67/303*** (2013.01); ***H04L 67/306*** (2013.01);
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See application file for complete search history.

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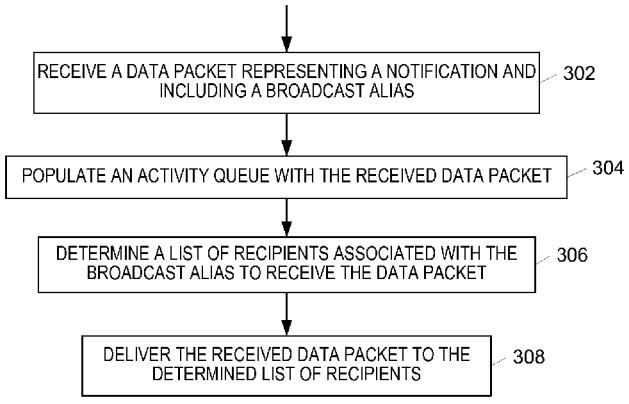
(57) **ABSTRACT**

Processing a notification intended for delivery to multiple recipients associated with a broadcast list. Software executes within an alerts service environment to receive a notification addressed to a broadcast alias, determine a list of recipients associated with the broadcast alias to receive the notification, and broadcast the received notification to each recipient in the determined list.

19 Claims, 6 Drawing Sheets



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WO	WO 9923591	5/1999
WO	WO 0051031	8/2000
WO	WO 02073339	9/2002
WO	WO 02073392	9/2002
WO	WO 02073442	9/2002
WO	WO 02073454	9/2002
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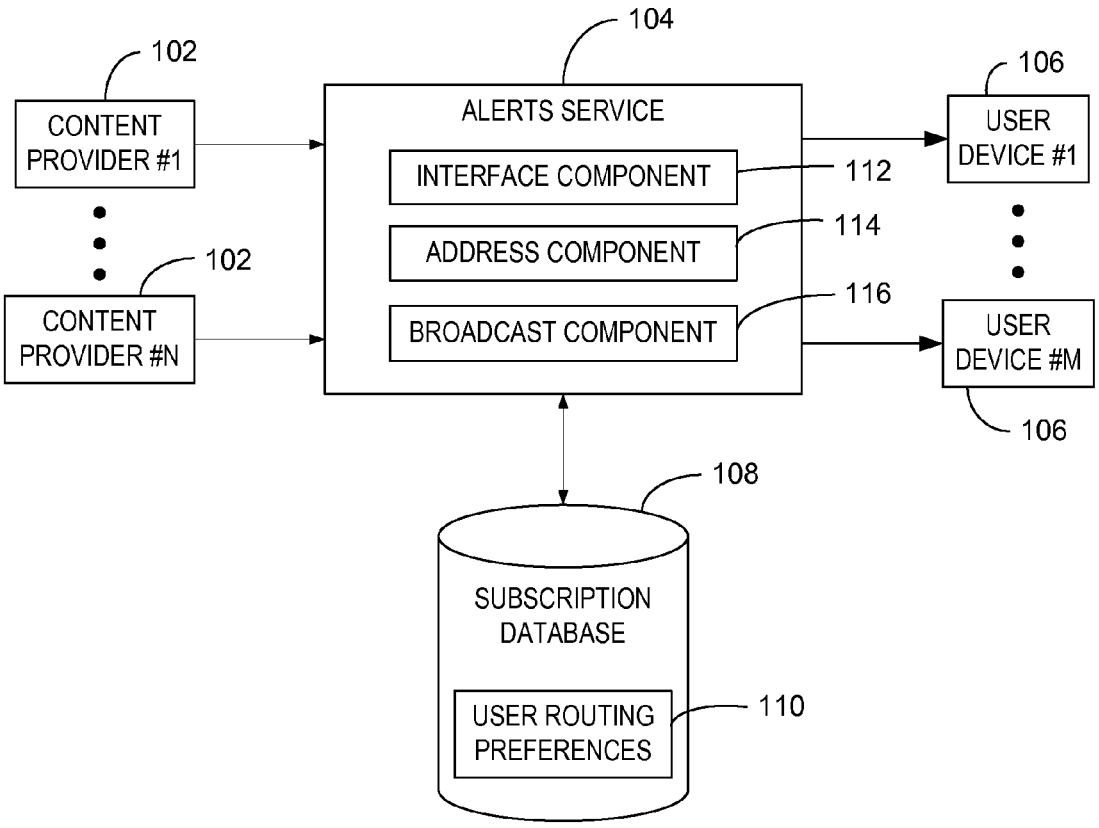
FIG. 1


104
102
CONTENT PROVIDER #1
102
CONTENT PROVIDER #N
ALERTS SERVICE
INTERFACE COMPONENT
112
ADDRESS COMPONENT
114
BROADCAST COMPONENT
116
106
USER DEVICE #1
USER DEVICE #M
106
108
SUBSCRIPTION DATABASE
USER ROUTING PREFERENCES
110

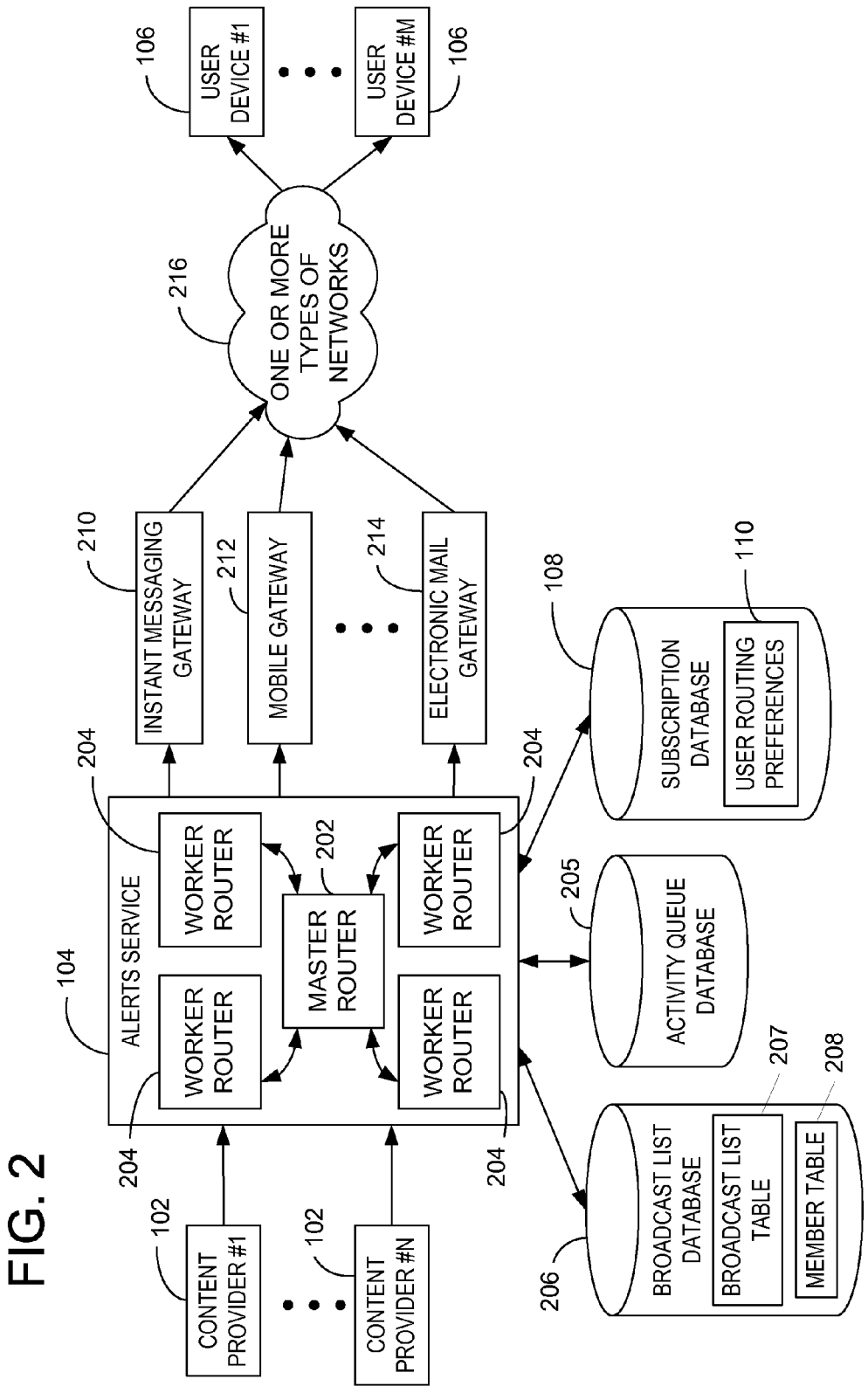

106
USER DEVICE #1
USER DEVICE #M
106
216
ONE OR MORE TYPES OF NETWORKS
210
INSTANT MESSAGING GATEWAY
212
MOBILE GATEWAY
214
ELECTRONIC MAIL GATEWAY
204
204
108
SUBSCRIPTION DATABASE
USER ROUTING PREFERENCES
110
104
ALERTS SERVICE
WORKER ROUTER
WORKER ROUTER
MASTER ROUTER
202
WORKER ROUTER
WORKER ROUTER
205
ACTIVITY QUEUE DATABASE
204
204
102
CONTENT PROVIDER #1
102
CONTENT PROVIDER #N
206
BROADCAST LIST DATABASE
BROADCAST LIST TABLE
207
MEMBER TABLE
208

FIG. 2

FIG. 3

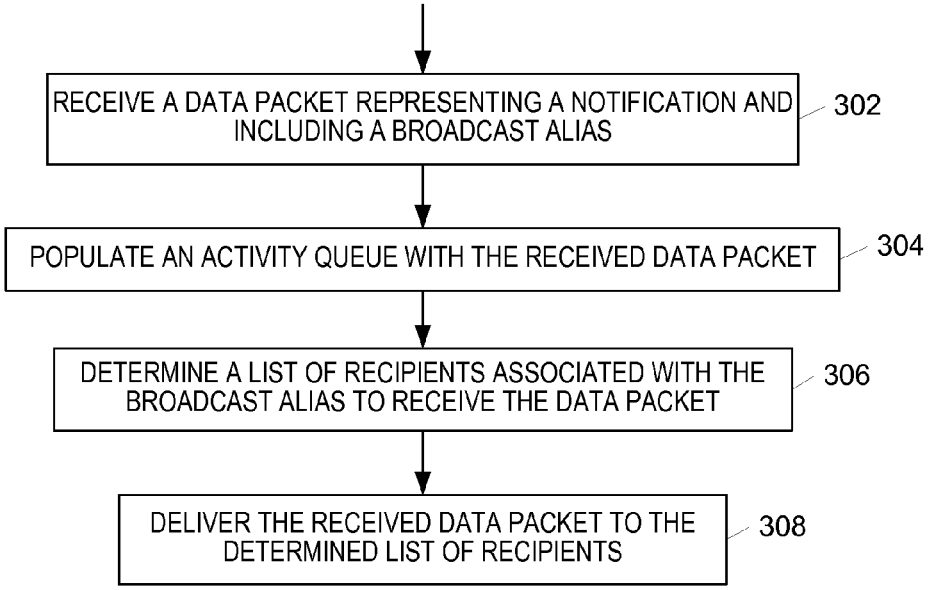

RECEIVE A DATA PACKET REPRESENTING A NOTIFICATION AND INCLUDING A BROADCAST ALIAS
302
POPULATE AN ACTIVITY QUEUE WITH THE RECEIVED DATA PACKET
304
DETERMINE A LIST OF RECIPIENTS ASSOCIATED WITH THE BROADCAST ALIAS TO RECEIVE THE DATA PACKET
306
DELIVER THE RECEIVED DATA PACKET TO THE DETERMINED LIST OF RECIPIENTS
308

FIG. 4A

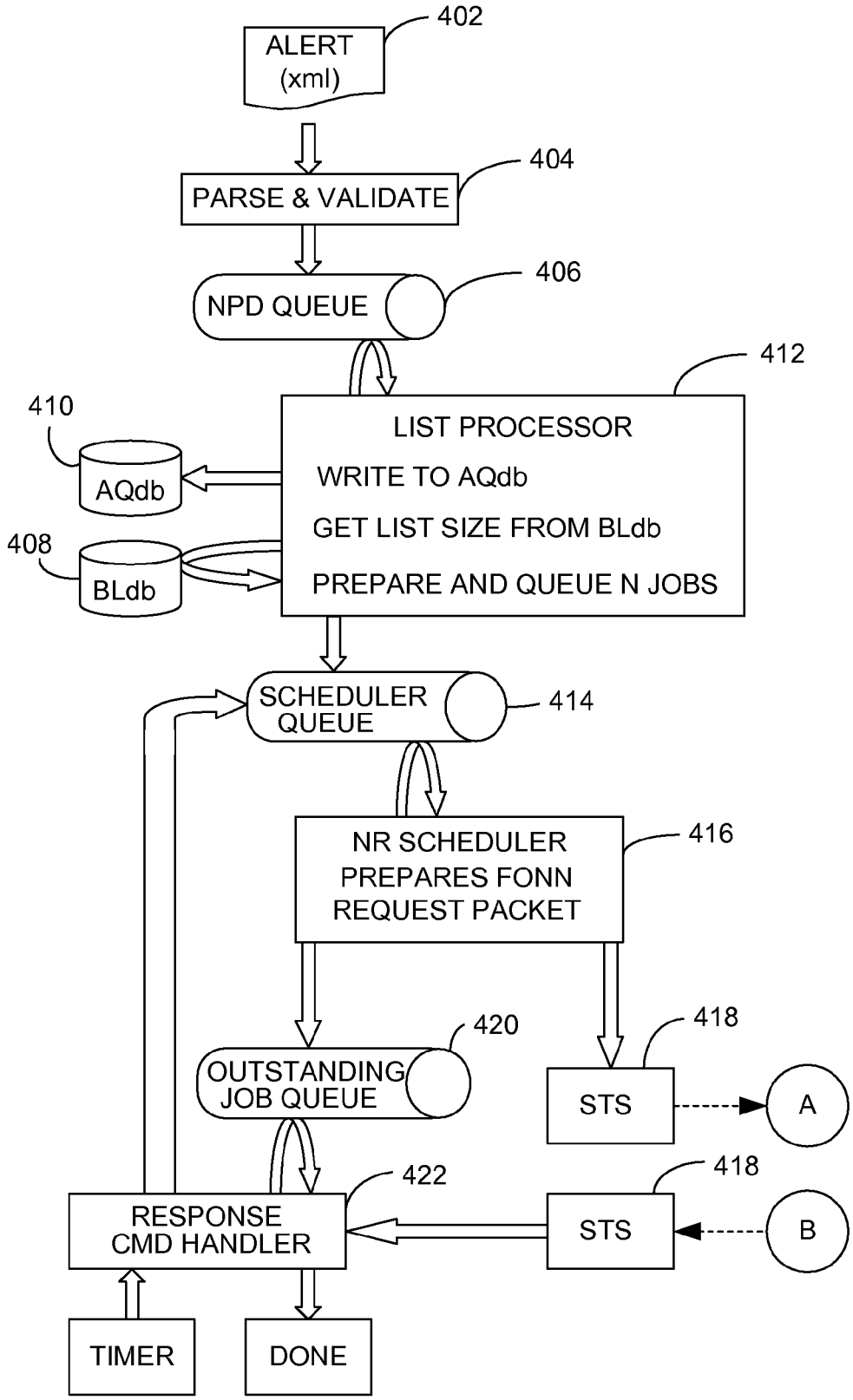
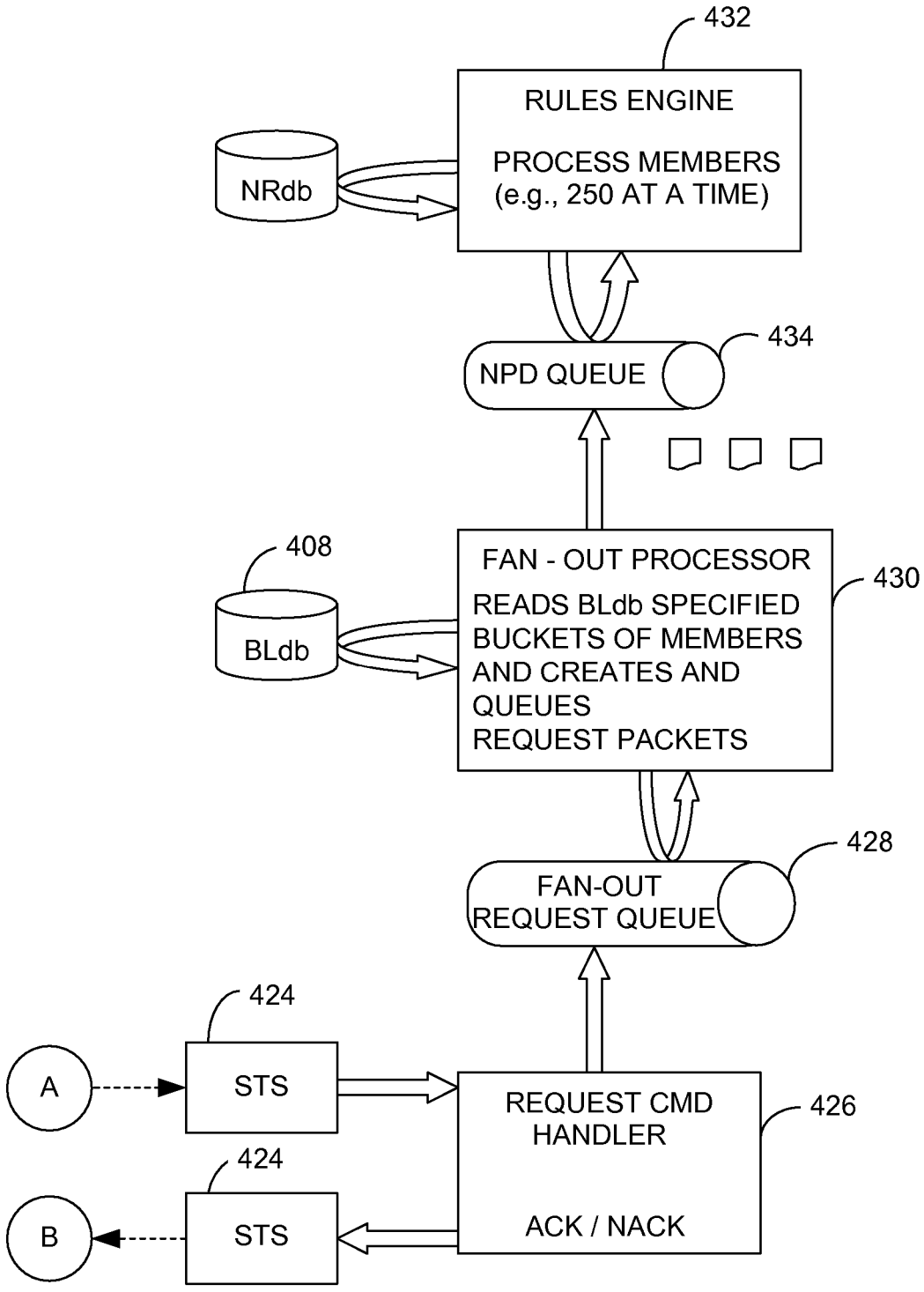
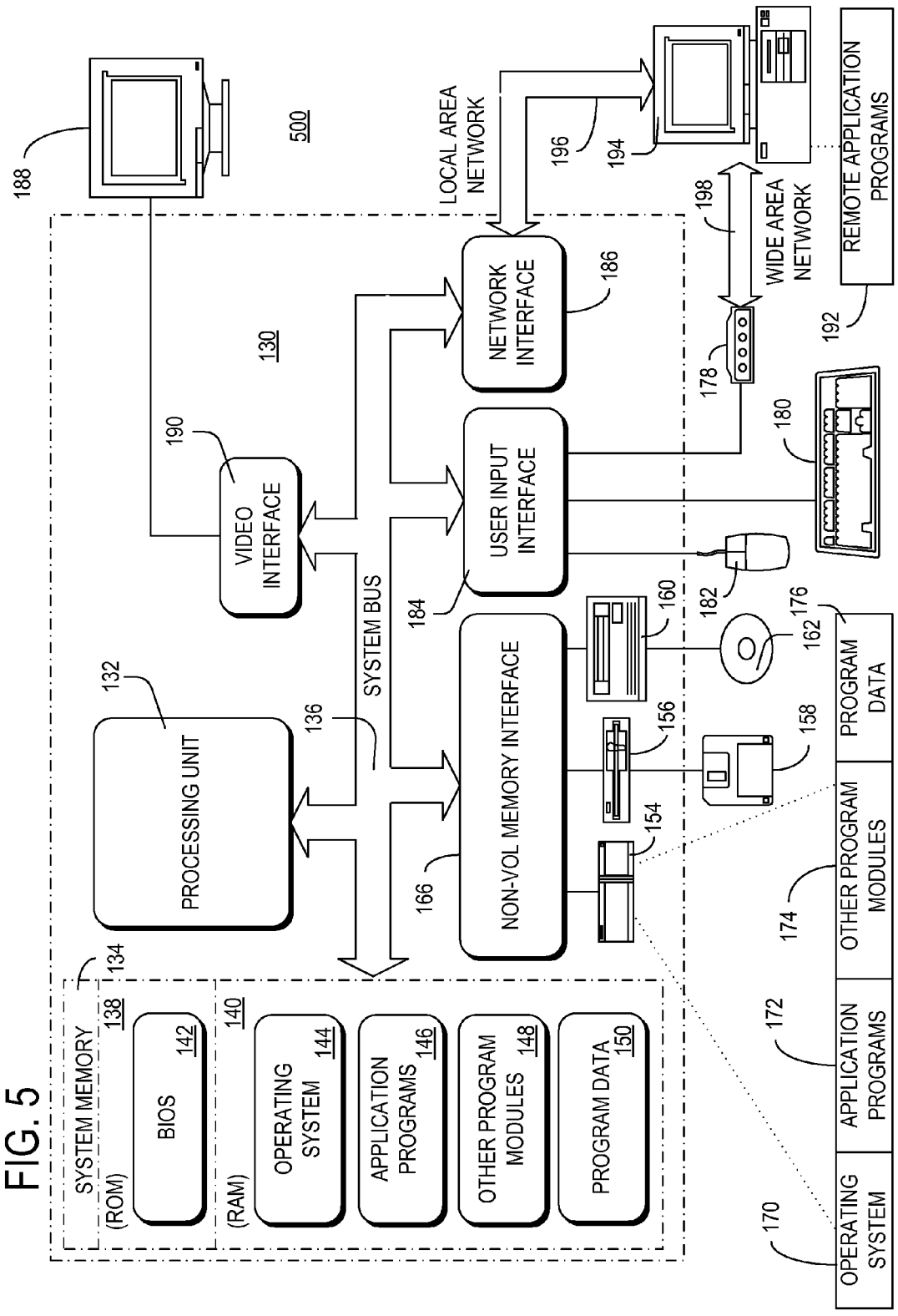

402
ALERT
(xml)
404
PARSE & VALIDATE
406
NPD QUEUE
412
410
LIST PROCESSOR
AQdb
WRITE TO AQdb
GET LIST SIZE FROM BLdb
408
BLdb
PREPARE AND QUEUE N JOBS
SCHEDULER
QUEUE
414
NR SCHEDULER
PREPARES FONN
REQUEST PACKET
416
420
418
OUTSTANDING
JOB QUEUE
STS
A
422
418
RESPONSE
CMD HANDLER
STS
B
TIMER
DONE

FIG. 4B


432
RULES ENGINE
PROCESS MEMBERS
(e.g., 250 AT A TIME)
NRdb
434
NPD QUEUE
408
BLdb
FAN - OUT PROCESSOR
READS BLdb SPECIFIED
BUCKETS OF MEMBERS
AND CREATES AND
QUEUES
REQUEST PACKETS
430
428
FAN-OUT
REQUEST QUEUE
424
A
STS
REQUEST CMD
HANDLER
426
424
B
STS
ACK / NACK


188
500
LOCAL AREA NETWORK
196
194
198
WIDE AREA NETWORK
REMOTE APPLICATION PROGRAMS
192
NETWORK INTERFACE
186
130
178
180
190
VIDEO INTERFACE
USER INPUT INTERFACE
SYSTEM BUS
184
182
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NON-VOL MEMORY INTERFACE
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OTHER PROGRAM MODULES
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SYSTEM MEMORY
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140
(RAM)
OPERATING SYSTEM
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APPLICATION PROGRAMS
146
OTHER PROGRAM MODULES
148
PROGRAM DATA
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172
APPLICATION PROGRAMS
170
OPERATING SYSTEM

FIG. 5

DISTRIBUTING NOTIFICATIONS TO MULTIPLE RECIPIENTS VIA A BROADCAST LIST

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of prior pending U.S. patent application Ser. No. 10/696,916, filed Oct. 30, 2003, and a continuation-in-part of prior pending U.S. patent application Ser. No. 10/017,680, filed Oct. 22, 2001, which claims the benefit of U.S. Provisional Patent Application Ser. No. 60/275,809, filed Mar. 14, 2001, all three of which applications are hereby incorporated by reference herein in their entirety for all purposes.

BACKGROUND

Some prior systems broadcast messages to alert users to information (e.g., for example, news updates). The broadcast messages, alerts, or other notifications include individual packets of information sent to users. These systems broadcast the messages by sequentially sending individually addressed messages (e.g., multiple messages to one addressed user, or multiple instances of one message to several addressed users). That is, the alerts are sent one by one using multiple packets even though the same information is sent to multiple users. In such systems, an individual alert is sent for each recipient. Other systems only accommodate up to twenty recipients per message. However, these systems require the content provider to explicitly address each of the recipients.

Some systems use an electronic mail alias to distribute a single electronic mail message to multiple recipients. However, such a system is dependent on and limited to the electronic mail transport medium. Existing systems fail to use a plurality of transport mediums.

Accordingly, a system for distributing notifications to multiple recipients via a broadcast list is desired to address one or more of these and other disadvantages.

SUMMARY

Embodiments of the invention include creating a broadcast list of recipients of a particular alert. Content providers send the broadcast alert to the broadcast list effecting delivery of the alert to each of the recipients on the broadcast list. In one embodiment, the broadcast list is managed and maintained by an alerts web service. A broadcast alert is intended for a scenario in which the same alert content is to be sent to multiple recipients. In one embodiment, the broadcast list represents a set of users who want to receive content such as a daily news update, breaking news, a weather forecast, or a traffic report. With a broadcast list, a content provider only sends one alert to the broadcast list instead of sending thousands or millions of alerts with each one addressed to one person only.

The broadcast list in embodiments of the invention provides scalability and allows alerts to be handled in a cost-effective way for both the content provider and distributor of alerts. Further, the broadcast list allows the content provider to offload the management and distribution of alerts to an alerts service and simplify the operations of the content provider. This reduces the packet traffic from the content providers to the alerts service significantly, and also allows the alerts service to scale better in terms of the number of packets processed per computing device associated with the web service and the reduction in database storage for the alert messages. Benefits of the broadcast list are significant particularly when the broadcast list size is fairly large (e.g., tens of thousands of members to several million members per list). Further, aspects of the invention transcend any one particular medium of delivery. That is, multiple mediums such as electronic mail, instant messaging, and mobile short-message-service messaging may be used.

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

Other features will be in part apparent and in part pointed out hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram illustrating one example of a suitable alerts service environment in which embodiments of the invention may be implemented.

FIG. **2** is an exemplary block diagram illustrating a detailed view of the alerts service illustrated in FIG. **1**.

FIG. **3** is an exemplary flow chart illustrating operation of the alerts service.

FIG. **4**A is an exemplary block diagram illustrating operation of software executed by a master router in the alerts service.

FIG. **4**B is an exemplary block diagram illustrating operation of software executed by a worker router in the alerts service.

FIG. **5** is a block diagram illustrating one example of a suitable computing system environment in which embodiments of the invention may be implemented.

Corresponding reference characters indicate corresponding parts throughout the drawings.

DETAILED DESCRIPTION

In an embodiment, the invention processes the distribution of an alert or notification (e.g., event-driven content). In particular, embodiments of the invention include software for receiving an alert from a content provider and broadcasting the alert to a plurality of users. A broadcast alert is intended for a scenario in which the same alert content is to be sent to multiple recipients. In one embodiment, the broadcast list represents a set of users who want to receive content such as a daily news update, breaking news, a weather forecast, or a traffic report. In one embodiment, an alert carries time-sensitive content. Broadcasting an alert according to the invention allows the content provider to delegate explicit addressing of the alert to the alerts service. That is, in an embodiment of the invention, the content provider transfers the addressing workload to the alerts service. The alerts service addresses the alert to each of the users associated with the broadcast alert, processes user preferences, and routes the addressed alerts to each of the intended users. Alternatively, the alerts service addresses the alerts but transfers the broadcasting workload to a gateway based on the user preferences (see FIG. **2** below). The gateway then performs the actual broadcasting of the alert to the intended users. In this embodiment, the alerts service forwards a single alert with multiple explicitly addressed users to the gateway. Further, aspects of the invention include thresholds for queue management to throttle requests incoming to the alerts service.

Alerts Environment

Referring first to FIG. **1**, an exemplary block diagram illustrates one example of a suitable alerts service environment in which embodiments of the invention may be implemented. In one example, the alerts service environment is referred to as a notification pipeline and database (NPD). FIG. **1** illustrates the communication flow between a content provider **102** such as content provider #**1** through content provider #N, an alerts service **104**, and a user device **106** such as user device #**1** through user device #M. The content provider **102**, the alerts service **104**, and the user device **106** are coupled to a data communication network such as described with reference to FIG. **5** (see below). The content provider **102** sends an alert to the alerts service **104** for delivery to one or more of the user devices **106**. The alerts service **104** accesses a subscription database **108** storing subscription information and user routing preferences **110** to determine which user device(s) **106** should receive the alert. The alerts service **104** then delivers the alert to the determined user device **106**.

The user device **106** may be a computer such as computer **130** described with reference to FIG. **5**. Further, the user device **106** may execute an alerts application (e.g., an instant messaging application) that receives and processes alerts. The alerts application executes on a user device **106** such as a cellular telephone (e.g., a Smartphone device), a pager, and a handheld computing device (e.g., a personal digital assistant or a Pocket PC device). Further, the user device **106** may include any of the above exemplary devices enabled with an information service such as a SMART PERSONAL OBJECTS TECHNOLOGY (SPOT) brand of telecommunication service and/or devices. The information service comprises a computing infrastructure (e.g., a telecommunication service) for sending data and information to personal and home devices via computer networks, wireless networks and the Internet. User devices **106** which may be enabled with the information service include, but are not limited to, the following devices: clocks, alarm clocks, radios incorporating clocks, watches, billfolds, wallets, checkbook and passbook wallets, purses, pens, metal key rings, key holders, wireless devices, computer hardware (e.g., peripherals, monitors, and displays), electronic calendar devices, and refrigerator magnets. Further, magazines, books, and user manuals relating to computers, computer programs, personal information devices and wireless communications may also incorporate the information service. The information service enables billions of devices to communicate with each other. For example, customers select the type of information and services they want to receive on the enabled devices via a configuration web page. This content is subsequently beamed to and displayed on the device. Information available to users on devices using the information service includes personal messages, calendar updates, and customized news, weather, financial and sports information.

The alerts service illustrated in FIG. **1** transcends any one particular transport medium for delivery of notifications. Aspects of the invention may use any of a plurality of transport mediums such as electronic mail, instant messaging, and mobile short-message-service messaging.

The system of FIG. **1** processes a notification or alert. The alerts service **102** includes a memory area storing a notification received from a third-party content provider **102**. In one example, the memory area includes a plurality of databases. An interface component **112** receives a data packet representing the notification. The notification includes routing information and content. The routing information includes a broadcast alias. One or more computing devices associated with the alerts service **104** enable delivery of the stored notification to a plurality of users based on the broadcast alias. Software executing on each of the computing devices accesses the stored notification, determines a list of users associated with the broadcast alias for receiving the stored notification, and delivers the stored notification to the determined list of users. In one embodiment, an address component **114** determines the list of recipients associated with the broadcast alias to receive the notification. Further, a broadcast component **116** routes the notification to the determined list of recipients.

In one embodiment, the system of FIG. **1** is implemented as a web service. Further, functionality associated with the alerts service **104** of FIG. **1** may be distributed among one or more computers. For example, the alerts service **104** may include a distributed processing system such as illustrated in FIG. **2**.

Referring next to FIG. **2**, an exemplary block diagram illustrates a detailed view of the alerts service **104** illustrated in FIG. **1**. In this embodiment, the plurality of computing devices includes a master router **202** and a plurality of worker routers **204**. The master router **202** associates the stored notification with one of the plurality of worker routers **204**. Broadcast list processing is distributed by the master router **202** across the plurality of worker routers **204** such as NRouters. The worker routers **204** accept or reject the assigned workload based on their currently assigned workload. While any worker router **204** may act as a master router **202**, the NRouter that originally receives the alert from the content provider **102** is designated as the master router **202**. The master router **202** coordinates the processing of the received alert across other worker NRouters **204**. The master router **202** also functions as a worker NRouter **204** to process alerts. The master NRouter **202** is responsible for logging the alert to a memory area such as an activity queue database **205**. The master **202** and worker **204** routers communicate with each other through an STS (server-to-server) layer (see FIG. **4**). The STS layer includes a communication component that provides a network connection between or among all routers in the system. The master router **202** and the worker routers **204** communicate with each other through an STS component. In one embodiment, a maximum of 256 worker NRouters **204** process a single broadcast list. However, there is no limit on the number of broadcast NRouters that may be deployed.

A unicast NRouter handles alert packets that are explicitly addressed to a particular user by the content provider **102**. A broadcast NRouter or worker NRouter **204** processes alert packets that are addressed to a broadcast list. Both types of routers are built out of the same code base so that any NRouter may actually act as both unicast and broadcast at the same time if necessary to improve efficiency and scalability. All the broadcast NRouters are behind one fan-out logical store. The mappings are installed through an application program such as dbsmgmt. An NRouter is designated as a broadcast NRouter by adding the following entry into a configuration file such as soft.xml with appropriate values for the MAC and IP attributes and installing the mappings:

<server nam="nrouter_bcast" mac=" . . . " ip=" . . . "/>

In another configuration file such as notifications.conf, a NPD_NROUTER_CLASS field is set to Broadcast in an [NPD] section.

The master **202** and worker **204** routers access a computer-readable medium storing a data structure (e.g., in a broadcast list database **206**). The data structure may be associated with an application programming interface. The data structure includes a broadcast list identifier associated

with the broadcast alias and a list of the users associated with the broadcast list identifier. In one embodiment, the broadcast list database **206** includes a broadcast list table **207** associating the broadcast list identifier with a specific member table **208** storing the list of users associated with the broadcast list identifier. The subscription database **108** or a user profile database stores the user routing preferences **110**. Invention software routes the stored notification to the users on the determined list based on user routing preferences **110** corresponding thereto stored in the subscription database **108**.

In another embodiment, the alerts service identifies the users associated with the broadcast alias, but sends the notification and the identified users to one or more third-party gateways for delivery. For example, the gateways may include an instant messaging gateway **210**, a mobile gateway **212**, and an electronic mail gateway **214**. The third-party gateways route the notification to the user devices **106** associated with the identified users via one or more types of networks **216**.

Alerts Service Operation

Referring next to FIG. **3**, an exemplary flow chart illustrates operation of the alerts service. One or more computer-readable media have computer-executable instructions for performing the method illustrated in FIG. **3**. Software or other computer-executable instructions embodying aspects of the invention receives a data packet representing a notification at **302**. The data packet has routing information including a broadcast alias. The software populates an activity queue with the received data packet at **304** and subsequently accesses the activity queue to obtain the stored data packet. The software determines a list of recipients associated with the broadcast alias to receive the data packet at **306**. In one embodiment, the software retrieves a broadcast list identifier from a broadcast list table via the broadcast alias. The software identifies one or more recipients associated with the broadcast list identifier by accessing a member list table. The software delivers the received data packet to the determined list of recipients at **308**.

In the master/worker router embodiment of FIG. **2**, the software receives an alert from a content provider directed to a broadcast list alias. The master router parses the alert packet and verifies or validates the content provider. The master router stores the alert in the activity queue database. The master router accesses the broadcast list database using information in the packet such as the broadcast list alias. In one embodiment, the master router uses a content provider identifier and the alias to obtain the broadcast list identifier. There is a user/member table for each broadcast list identifier which lists all users/members associated with the broadcast list identifier. For example, the member table may be one table with multiple partitions. Every row in the member table has a broadcast list identifier, a sequence number (unique to the broadcast list identifier and user), and a unique identifier for each user.

The master router distributes processing based on the number of members for the broadcast list identifier and the number of worker routers available. The master router may queue multiple work items for each worker router. In one embodiment, the master router stores a table of the worker routers (including itself) in memory such as a state table. In another embodiment, the master router stores the table in a database such as a persistent SQL database. Storing the state information in a database provides reliability should the master router become unavailable.

Each worker router accepts assigned work (e.g., by accessing the activity queue) and processes the assigned work item by accessing the member table to obtain a list of users, loading user preferences (e.g., from a user profile database) for each user on the list, and delivering the alert to each user based on the preferences. In one embodiment, the user profile database includes a SQL table indexed by a user identifier, a user name, and routing preferences.

With aspects of the invention, each content provider sends a single packet to the alerts service for delivery to a broadcast list of users. In an alternative embodiment, the alerts service identifies the individual users associated with the broadcast list, and transfers the packet and the list of users to another computing device (e.g., a gateway) to perform the routing. That is, the software sends the received data packet and the determined list of recipients to a third-party gateway for routing the received data packet to each of the recipients on the determined list. The software effects the routing of the received notification to each of the recipients on the determined list.

In particular, an NRouter identifies a packet addressed to a broadcast list by the presence of the attribute listed on the TO element as shown below:

<TO listid=" . . . ">

In one form, the listid is in hexadecimal format and between the range 0 through (2^32)−1 (i.e., approximately four billion values). This corresponds to the npd_ListID column in the npd_BroadcastList table discussed below. The content provider provisions the listid with the alerts service.

Referring next to FIG. **4**A, an exemplary block diagram illustrates operation of software executed by a master router in the alerts service. When a content provider posts an alert **402** such as in the form of an extensible markup language (XML) document to the master NRouter at **402**, the master NRouter parses the alert **402** and validates the packet at **404**. In one embodiment, the master NRouter applies usage and throttle limits. The master NRouter then acknowledges receipt of the alert **402** by returning a message with HSE_STATUS_PENDING status to the content provider. The master NRouter asynchronously processes the alert **402** by queuing the alert **402** into an NPD queue **406** or other memory area. The NPD queue **406** represents an internal queue of work items that are acted upon by any one of the multiple threads in the thread pool, but only one thread processes the item at any given time.

The master NRouter then retrieves information regarding the specific broadcast list specified in the alert **402**, such as the number of members or users, and an internal 32-bit row identifier from a database such as BLdb. The master NRouter enforces the usage limits for the content provider, if any, and logs the alert **402** to an activity queue database such as AQdb **410**. A copy of the broadcast activity is logged to every physical bucket in each activity queue physical store. This is done before returning a final status to the content provider. If the master NRouter is unsuccessful during any of the above processing, it returns an error code such as "500 Server Error" with status=600. Otherwise, the master NRouter returns "202 Accepted" with status=100.

A list processor module **412** associated with the master NRouter picks up the queued packet and uses the size of the broadcast list to determine an optimum number of processing jobs to schedule across the worker NRouters. These jobs are then queued into a scheduler queue **414** and handed off to a scheduler module **416** which packages each job into a request packet (e.g., as defined by a fan-out protocol) and assigns each job to an appropriate logical area of the logical NRouter in the STS layer **418**. These logical areas map to the various NRouters. The scheduler module **416** also adds an entry into an outstanding jobs queue **420** with an appropriate

expiration timestamp. The list row identifier, a tick-count and a chunk identifier together make up the key by which the outstanding jobs queue **420** is searched. A response command handler **422** or other monitor process executing on the master NRouter periodically checks the outstanding jobs queue **420** (e.g., every 5 minutes) and reschedules expired jobs if necessary. In one embodiment, the periodic interval is configurable and rescheduling occurs up to a total of three times before discarding the job.

Referring next to FIG. **4**B, an exemplary block diagram illustrates operation of software executed by a worker router in the alerts service. On the worker NRouter, the request packet is picked up from the STS layer **424**. If that worker NRouter is willing to accept this work item, a request command handler **426** sends an acknowledgement (ACK) back to the master NRouter. Otherwise, the request command handler **426** returns a not acknowledged (NACK) status (see the fan-out NRouter to NRouter protocol illustrated in FIG. **4**A). One implementation returns the ack/nack immediately and does not wait for the worker NRouter to complete its task. The job is then queued into a fan-out request queue **428**. A fan-out processor **430** reads the BLdb database **408** for a range of members defined by the chunk identifiers specified in the request packet. The fan-out processor **408** creates small blocks of members (e.g., 250 members per block) for further processing by a rules engine **432**. These configurable blocks are added to an NPD queue **434**. The policy threads in the rules engine **432** process each block independently.

The master NRouter maintains an in-memory table of its pending jobs. Since it is in-memory, the table is susceptible to master NRouter failures. To improve reliability, the master NRouter periodically writes out its state into a table such as a structured query language (SQL) table. The worker NRouters work off of the database to update the rows corresponding to each work item belonging to a particular fan-out request. The master NRouter (or a secondary master) monitors the work items that are being updated in the database.

The following tables show exemplary request and response packet formats for use with the alerts service. The master NRouter sends the request packet to the worker NRouter to assign an alert to the worker NRouter. The worker NRouter accepts or declines the assigned alert via the response packet.

TABLE 1

Request Packet Format.

CMD	KEY	ChunkID Start	ChunkID End	XML Size	XML Packet

TABLE 2

Response Packet Format.

CMD	KEY	ChunkID Start	ChunkID End

The CMD field indicates one of the following: fan-out request processing (i.e., requests an NRouter to process a fan-out job), fan-out response accepted (i.e., worker NRouter accepts the task), or fan-out response declined (i.e., worker NRouter declines the task). The KEY field correlates outstanding jobs in the Master NRouter with the worker NRouter responses. In one example, the key field includes a List RowID and a Tick-count. The ChunkID Start and End fields specify an interval within the broadcast List member range that a worker NRouter is to process. In one example, the ChunkID start and end fields map to npd_Bucket in an npd_BroadcastListMembers table.

The fan-out processor may be fine-tuned using the following configuration settings (e.g., such as in a notifications.conf file). An NPD_BROADCAST_WORKER_IDEAL_JOB_SIZE setting represents an integral value that is used as a guideline by the master NRouter when assigning work to the worker NRouters. A default value includes 1000 list members per worker NRouter per request. An NPD_BROADCAST_JOB_EXPIRATION_TIMEOUT setting, in milliseconds, represents the time period to wait before attempting to reschedule the job with another worker NRouter. A default value includes one minute. An NPD_BROADCAST_MEMBERS_PER_POLICY_BLOCK setting represents the maximum number of recipients that are associated with an instance of the policy block. A default value includes 250 recipients.

Broadcast List Databases

Exemplary databases and tables involved with broadcast list processing include npd_BLdb_rw_1 and npd_BLdb ro_{13} 1. They both contain the tables npd_BroadcastList and npd_BroadcastListMembers, and both databases have identical content.

Web page front-end computers read and write to npd_BLdb_rw_1. The broadcast list provisioning also occurs on this database. The SQL instance hosting this database also acts as a distributor for transaction replication to populate npd_BLdb_ro_1. This latter database is used by the NRouter front ends at run time. The database npd_BLdb_rw_1 may be deployed on a different network switch than npd_BLdb_ro_1. These databases are accessed in NPD via the NSD_STORE_NPD_LISTS and NSD_STORE_NPD_LISTS_PROTECTED logical stores, respectively.

The following statements create these databases in the file soft.xml:

```
<?xml version="1.0"?>
<service n="..." >
  <physicalstore srv="hostName" dtyp="blrw" />
  <physicalstore srv="hostName" dtyp="blro" />
</service>
```

In the above statements, srv represents the appropriate host machine names.

Both BLdb RW and RO databases are setup to do Read-Only failover at physical bucket (PB) level. The number of PBs for the RW database is equal to the number of RO databases (physical stores), the number of PBs for the RO database is equal to 2 per physical store. The failover generation algorithm also takes into account the network switch if specified.

TABLE 3

Exemplary Schema for npd_BroadcastList Table.
Npd_Broadcast_List Table

npd_CPID (4 Bytes)	npd_ListID (4 Bytes)	npd_RowID (4 Bytes)	npd_MemberCount (4 Bytes)	npd_Language (4 Bytes)	npd_DisplayName (64 Bytes)
CP1	ListID1	1	1000000	0	Breaking News
CP1	ListID2	2	50000	0	Local News
CP2	ListID1	3	15000	0	Seattle Traffic

Each row in Npd_BroadcastList table represents one broadcast list. The npd_CPID and npd_ListID together uniquely identify a list, as does the npd_RowID column by itself. The npd_CPID column corresponds to the npd_Row column in the Content Provider table. This column contains the site ID of the content provider that owns the List. The npd_ListID column contains List owner (e.g., Content Provider) defined data, and its semantics are known to the NRouter. The owner has the entire range of values at its disposal. The npd_RowID column is the identity column that contains a unique 32-bit number, and is generally used within the NPD to identify Lists. This column is related to npd_RowID column in npd_BroadcastListMembers table. This column also corresponds to the npd_SubscriptionId column in the npd_Subscriptions table in the user profile database. In the case of broadcast activities in activity queue database, its value is used for npd_ReceiverIDRow column in npd_Activity2 table. In one example, the npd_RowID is a 32-bit number. The bits or a subset thereof may be organized or otherwise given specific meaning. For example, a subset of the bits may identify a specific alert such as an hourly news update or a nightly news update. In one embodiment, the invention software codes npd_CPID and npd_ListID to map to a specific npd_RowID for lookups and modification to a specific broadcast list.

The npd_MemberCount column contains the count of members belonging to each broadcast list. The master NRouter uses this count to decompose a fan-out request into an optimum number of jobs that are then distributed across worker NRouters. The npd_Language column holds locale information in one embodiment. The npd_DisplayName column contains a user-displayable string for the given broadcast list. There may be more than one row sharing the same topic information as long as the provider specific data portion is unique. The display name is available on the first row if there are multiple rows, with the remaining rows containing a NULL for this column value.

Npd_Broadcast_List_Members Table

Each row in this exemplary table represents one subscription to a broadcast list.

TABLE 4

SQL Schema for npd_BroadcastListMembers Table.

npd_RowID (4 Bytes)	npd_Cluster (1 Byte)	npd_PUIDhigh (4 Bytes)	npd_PUIDlow (4 Bytes)
1	0	0x00000001	0x00000001
1	0	0x00000001	0x00000002
2	120	0x00000002	0x00000001
2	255	0x00000030	0x00000040
3	255	0x00000060	0x00000003
4	3	0x00000001	0x00000001
4	4	0x00000001	0x00000005
5	0	0x00000004	0x00000055
5	0	0x00000005	0x00000001

TABLE 4-continued

SQL Schema for npd_BroadcastListMembers Table.

npd_RowID (4 Bytes)	npd_Cluster (1 Byte)	npd_PUIDhigh (4 Bytes)	npd_PUIDlow (4 Bytes)
6	128	0x00000060	0x00000001
6	255	0x00000067	0x00000004

The npd_RowID column contains a 32-bit value that uniquely identifies a List. This column corresponds to the npd_RowID column in npd_BroadcastList table. The members of each List are grouped into one of the 256 possible npd_Cluster clusters. The master NRouter assigns one or more clusters at a time to each worker NRouter for processing. The value is based on a hash of the member PUID. The npd_PUIDhigh and npd_PUIDlow columns represent identifiers that uniquely identify a single user.

npd_Activity2 Table

The primary clustered index is based on npd_ReceiverIDtype, npd_ReceiverIDbucket, npd_ReceiverIDrow, and npd_ID. The npd_ReceiverIDtype ensures that all broadcast activities are grouped together and all unicast activities are together so as to take advantage of SQL page caching, as each broadcast activity is read by more than one user. Typically, the read/write ratio for broadcast activities is very high compared to unicast activities.

The NRouter logs a copy of the broadcast activity to each of the physical buckets in the activity queue database. During a read operation, the user is directed to one of these copies based on a function of the user's bucket.

Activity Queue Server (AQS)

The activity queue database stores the alerts for each user for a time interval (e.g., twenty-four hours) configurable by an administrator of the alerts service or by the user. In one example, a broadcast activity table includes multiple rows. Each row stores a user identifier and an alert. Each user may be allocated one or more rows. In another example, each message is stored once, while a list of recipients of the message is stored and associated with the message.

The AQS runs a separate set of threads to handle broadcast activity expiration enforcement, and dirty bucket cleanup due to failover. The related SQL stored procedures have been modified to take an extra argument to distinguish broadcast from unicast activities. Broadcast activities are cleaned up at the same frequency as unicast activities.

Broadcast List Programming Interface

Application programming interfaces (APIs) are exposed (e.g., as a web service) to content providers to create and maintain broadcast list IDs. In one example, this function is implemented by a subscription management service. Exemplary APIs for managing broadcast lists are described in Appendix A.

Exemplary Operating Environment

FIG. **5** shows one example of a general purpose computing device in the form of a computer **130**. In one embodiment of the invention, a computer such as the computer **130** is suitable for use in the other figures illustrated and described herein. Computer **130** has one or more processors or processing units **132** and a system memory **134**. In the illustrated embodiment, a system bus **136** couples various system components including the system memory **134** to the processors **132**. The bus **136** represents one or more of any of several types of bus structures, including a memory bus or memory controller, a peripheral bus, an accelerated graphics port, and a processor or local bus using any of a variety of bus architectures. By way of example, and not limitation, such architectures include Industry Standard Architecture (ISA) bus, Micro Channel Architecture (MCA) bus, Enhanced ISA (EISA) bus, Video Electronics Standards Association (VESA) local bus, and Peripheral Component Interconnect (PCI) bus also known as Mezzanine bus.

The computer **130** typically has at least some form of computer readable media. Computer readable media, which include both volatile and nonvolatile media, removable and non-removable media, may be any available medium that may be accessed by computer **130**. By way of example and not limitation, computer readable media comprise computer storage media and communication media. Computer storage media include volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information such as computer readable instructions, data structures, program modules or other data. For example, computer storage media include RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical disk storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium that may be used to store the desired information and that may be accessed by computer **130**. Communication media typically embody computer readable instructions, data structures, program modules, or other data in a modulated data signal such as a carrier wave or other transport mechanism and include any information delivery media. Those skilled in the art are familiar with the modulated data signal, which has one or more of its characteristics set or changed in such a manner as to encode information in the signal. Wired media, such as a wired network or direct-wired connection, and wireless media, such as acoustic, RF, infrared, and other wireless media, are examples of communication media. Combinations of the any of the above are also included within the scope of computer readable media.

The system memory **134** includes computer storage media in the form of removable and/or non-removable, volatile and/or nonvolatile memory. In the illustrated embodiment, system memory **134** includes read only memory (ROM) **138** and random access memory (RAM) **140**. A basic input/output system **142** (BIOS), containing the basic routines that help to transfer information between elements within computer **130**, such as during start-up, is typically stored in ROM **138**. RAM **140** typically contains data and/or program modules that are immediately accessible to and/or presently being operated on by processing unit **132**. By way of example, and not limitation, FIG. **5** illustrates operating system **144**, application programs **146**, other program modules **148**, and program data **150**.

The computer **130** may also include other removable/non-removable, volatile/nonvolatile computer storage media. For example, FIG. **5** illustrates a hard disk drive **154** that reads from or writes to non-removable, nonvolatile magnetic media. FIG. **5** also shows a magnetic disk drive **156** that reads from or writes to a removable, nonvolatile magnetic disk **158**, and an optical disk drive **160** that reads from or writes to a removable, nonvolatile optical disk **162** such as a CD-ROM or other optical media. Other removable/non-removable, volatile/nonvolatile computer storage media that may be used in the exemplary operating environment include, but are not limited to, magnetic tape cassettes, flash memory cards, digital versatile disks, digital video tape, solid state RAM, solid state ROM, and the like. The hard disk drive **154**, and magnetic disk drive **156** and optical disk drive **160** are typically connected to the system bus **136** by a non-volatile memory interface, such as interface **166**.

The drives or other mass storage devices and their associated computer storage media discussed above and illustrated in FIG. **5**, provide storage of computer readable instructions, data structures, program modules and other data for the computer **130**. In FIG. **5**, for example, hard disk drive **154** is illustrated as storing operating system **170**, application programs **172**, other program modules **174**, and program data **176**. Note that these components may either be the same as or different from operating system **144**, application programs **146**, other program modules **148**, and program data **150**. Operating system **170**, application programs **172**, other program modules **174**, and program data **176** are given different numbers here to illustrate that, at a minimum, they are different copies.

A user may enter commands and information into computer **130** through input devices or user interface selection devices such as a keyboard **180** and a pointing device **182** (e.g., a mouse, trackball, pen, or touch pad). Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are connected to processing unit **132** through a user input interface **184** that is coupled to system bus **136**, but may be connected by other interface and bus structures, such as a parallel port, game port, or a Universal Serial Bus (USB). A monitor **188** or other type of display device is also connected to system bus **136** via an interface, such as a video interface **190**. In addition to the monitor **188**, computers often include other peripheral output devices (not shown) such as a printer and speakers, which may be connected through an output peripheral interface (not shown).

The computer **130** may operate in a networked environment using logical connections to one or more remote computers, such as a remote computer **194**. The remote computer **194** may be a personal computer, a server, a router, a network PC, a peer device or other common network node, and typically includes many or all of the elements described above relative to computer **130**. The logical connections depicted in FIG. **5** include a local area network (LAN) **196** and a wide area network (WAN) **198**, but may also include other networks. LAN **136** and/or WAN **138** may be a wired network, a wireless network, a combination thereof, and so on. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets, and global computer networks (e.g., the Internet).

When used in a local area networking environment, computer **130** is connected to the LAN **196** through a network interface or adapter **186**. When used in a wide area networking environment, computer **130** typically includes a modem **178** or other means for establishing communications over the WAN **198**, such as the Internet. The modem **178**, which may be internal or external, is connected to system bus **136** via the user input interface **184**, or other appropriate mechanism. In a networked environment, program modules depicted relative to computer **130**, or portions thereof, may

be stored in a remote memory storage device (not shown). By way of example, and not limitation, FIG. **5** illustrates remote application programs **192** as residing on the memory device. The network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

Generally, the data processors of computer **130** are programmed by means of instructions stored at different times in the various computer-readable storage media of the computer. Programs and operating systems are typically distributed, for example, on floppy disks or CD-ROMs. From there, they are installed or loaded into the secondary memory of a computer. At execution, they are loaded at least partially into the computer's primary electronic memory. Aspects of the invention described herein include these and other various types of computer-readable storage media when such media contain instructions or programs for implementing the steps described below in conjunction with a microprocessor or other data processor. Embodiments of the invention also include the computer itself when programmed according to the methods and techniques described herein.

For purposes of illustration, programs and other executable program components, such as the operating system, are illustrated herein as discrete blocks. It is recognized, however, that such programs and components reside at various times in different storage components of the computer, and are executed by the data processor(s) of the computer.

Although described in connection with an exemplary computing system environment, including computer **130**, aspects of the invention are operational with numerous other general purpose or special purpose computing system environments or configurations. The computing system environment is not intended to suggest any limitation as to the scope of use or functionality of embodiments of the invention. Moreover, the computing system environment should not be interpreted as having any dependency or requirement relating to any one or combination of components illustrated in the exemplary operating environment. Examples of well known computing systems, environments, and/or configurations that may be suitable for use with aspects of the invention include, but are not limited to, personal computers, server computers, hand-held or laptop devices, multiprocessor systems, microprocessor-based systems, set top boxes, programmable consumer electronics, mobile telephones, network PCs, minicomputers, mainframe computers, distributed computing environments that include any of the above systems or devices, and the like.

Aspects of the invention may be described in the general context of computer-executable instructions, such as program modules, executed by one or more computers or other devices. Generally, program modules include, but are not limited to, routines, programs, objects, components, and data structures that perform particular tasks or implement particular abstract data types. Aspects of the invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote computer storage media including memory storage devices.

An interface in the context of a software architecture includes a software module, component, code portion, or other sequence of computer-executable instructions. The interface includes, for example, a first module accessing a second module to perform computing tasks on behalf of the first module. The first and second modules include, in one example, application programming interfaces (APIs) such as provided by operating systems, component object model (COM) interfaces (e.g., for peer-to-peer application communication), and extensible markup language metadata interchange format (XMI) interfaces (e.g., for communication between web services).

The interface may be a tightly coupled, synchronous implementation such as in Java 2 Platform Enterprise Edition (J2EE), COM, or distributed COM (DCOM) examples. Alternatively or in addition, the interface may be a loosely coupled, asynchronous implementation such as in a web service (e.g., using the simple object access protocol). In general, the interface includes any combination of the following characteristics: tightly coupled, loosely coupled, synchronous, and asynchronous. Further, the interface may conform to a standard protocol, a proprietary protocol, or any combination of standard and proprietary protocols.

The interfaces described herein may all be part of a single interface or may be implemented as separate interfaces or any combination therein. The interfaces may execute locally or remotely to provide functionality. Further, the interfaces may include additional or less functionality than illustrated or described herein.

In operation, computer **130** executes computer-executable instructions such as those illustrated in FIG. **3** to process a notification by receiving the notification addressed to a broadcast alias, determining the list of recipients associated with the broadcast alias, and delivering the notification to each recipient on the list.

The order of execution or performance of the operations in embodiments of the invention illustrated and described herein is not essential, unless otherwise specified. That is, the operations may be performed in any order, unless otherwise specified, and embodiments of the invention may include additional or fewer operations than those disclosed herein. For example, it is contemplated that executing or performing a particular operation before, contemporaneously with, or after another operation is within the scope of aspects of the invention.

When introducing elements of aspects of the invention or the embodiments thereof, the articles "a," "an," "the," and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements.

Having described aspects of the invention in detail, it will be apparent that modifications and variations are possible without departing from the scope of aspects of the invention as defined in the appended claims. As various changes could be made in the above constructions, products, and methods without departing from the scope of aspects of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

APPENDIX A

The following exemplary APIs enable management and maintenance of broadcast lists.

Broadcast List Table Related

Structure:

```
npdBroadcastList bufBL;
```

To create a broadcast list:

```
Set
  bufBL.ulCPID
  bufBL.ulListID
  bufBL.ulLanguage
  bufBL.szDisplayName
Call
  npdCreate(NSD_OBJECT_( NSD_STORE_NPD_LISTS,
  NPDTYPE_LIST), &bufBL);
```

To get all the properties of a broadcast list:

```
Set
  bufBL.ulCPID
  bufBL.ulListID
Call
  npdGet(NSD_OBJECT_( NSD_STORE_NPD_LISTS,
  NPDTYPE_LIST), 0, &bufBL);
```

To iterate all the broadcast lists:

```
Set
  bufBL.szDisplayName to non-empty string.
  bufBL.ulLanguage to ~0 (to retrieve all language rows)
Call
  npdGetIteratorHandle
  (NSD_OBJECT_( NSD_STORE_NPD_LISTS,
  NPDTYPE_LIST), NPDHOW_BYNAME, 0, &bufBL, ...);
  Similarly for npdGetIterator.
```

Broadcast List Members Table Related

Structure:

npdBroadcastListMember bufBLM;

To add a member to a broadcast list:

```
Set
  bufBLM.ulCPID
  bufBLM.ulListID
  bufBLM.ulPUIDhigh
  bufBLM.ulPUIDlow
Call
  npdCreate(NSD_OBJECT_( NSD_STORE_NPD_LISTS,
  NPDTYPE_LIST_MEMBER), &bufBLM);
```

To remove a member from a broadcast list:

```
Set
  bufBLM.ulCPID
  bufBLM.ulListID
  bufBLM.ulPUIDhigh
  bufBLM.ulPUIDlow
Call
  npdDelete(NSD_OBJECT_( NSD_STORE_NPD_LISTS,
  NPDTYPE_LIST_MEMBER), 0, &bufBLM);
```

To modify a broadcast list:

Use a combination of npdDelete and npdCreate to accomplish this operation.

To iterate all the broadcast list members:

```
Set
  bufBLM.ulRowID - obtained from npd_BroadcastList table.
  bufBLM.bCluster - Start of the range
  bufBLM.bCluster2 - End of the range
    bCluster = 0, bCluster2 = 255 returns the entire set of members,
    for large lists a subset is specified, bCluster = 0, bCluster2 = 1
    to return approximately the first 20% of the list, bCluster = 2,
    bCluster2 = 3 the next 20% and so on.
Call
  npdGetIteratorHandle (NSD_OBJECT_(
  NSD_STORE_NPD_LISTS_PROTECTED , NPDTYPE_LIST),
  NPDHOW_BYID, &bufBLM, ...);
  Similarly for npdGetIterator. The store type specified is the BLdb_ro,
  but BLdb_rw is also appropriate depending on the need.
```

Subscriptions Table Related

Structure:

npdListSubscription bufLS;

To create a broadcast list subscription for a user:

```
Set
  bufLS.ulCPID
  bufLS.ulListID
  bufLS.ulUserPUIDhigh
  bufLS.ulUserPUIDlow
  bufLS.bufSubscription.ulRouting
Call
  npdCreate(NSD_OBJECT_(NSD_STORE_NPD_USER,
  NPDTYPE_SUBSCRIPTION_LIST), &bufLS);
```

This does two things. 1) Creates an entry in the broadcast list member table 2) Creates an entry in the user subscriptions table.

To delete a single broadcast list subscription of a user:

```
Set
  bufLS.ulCPID
  bufLS.ulListID
  bufLS.ulUserPUIDhigh
  bufLS.ulUserPUIDlow
Call
  npdDelete(NSD_OBJECT_(NSD_STORE_NPD_USER,
  NPDTYPE_SUBSCRIPTION_LIST), NPDHOW_BYLISTS,
  &bufLS);
```

This does two things. 1) Deletes the entry in the broadcast list member table 2) Deletes the entry in the user subscriptions table.

To delete all broadcast list subscriptions for a content provider of a user:

```
Set
  bufLS.ulCPID
  bufLS.ulUserPUIDhigh
  bufLS.ulUserPUIDlow
Call
  npdDelete(NSD_OBJECT_(NSD_STORE_NPD_USER,
  NPDTYPE_SUBSCRIPTION_LIST), NPDHOW_BYCP, &bufLS);
```

This does two things. 1) Deletes all entries that belong to the given content provider for the user in the broadcast list member table 2) Deletes all the list subscription entries in the user subscriptions table that belong to the given content provider.

Activity Table Related

Structure:

npdBroadcastActivity bufBA (same as npdActivity)

To create a broadcast activity:

To create a copy of the broadcast activity in every physical bucket of each AQ logical store, use npdModify instead of npdCreate.

```
Set
    All the appropriate fields in bufBA, similar to npdActivity except the
    following:
        ulReceiverIDrow - contains the value of ulRowID column in
        npdBroadcastList table, for the given list.
        wReceiverIDbucket - is automatically computed by the API.
        usReceiverIDtype - should be NPDTYPE_LIST
Call
    npdModify(NSD_OBJECT_(
    NSD_STORE_NPD_BROADCASTACTIVITY,
    NPDTYPE_BROADCASTACTIVITY),
    NPDHOW_LOG_BROADCAST, &bufBA);
```

To get all broadcast activities belonging to a user:

Since the activities are filed under the list row identifier, the list row identifiers may be found by determining all the list subscriptions of the user. This information is input into a special query to gather all broadcast activities for the given user.

```
Set
    bufBA.ulReceiverIDrow - User's rowID.
    bufBA. wReceiverIDbucket - User's bucket
Call
    npdGetIteratorHandle (NSD_OBJECT_(
    NSD_STORE_NPD_BROADCASTACTIVITY,
    NPDTYPE_BROADCASTACTIVITY), NPDHOW_BYLISTS,
    &bufBA, ...);
```

Similarly for npdGetIterator.

What is claimed is:

1. A system for processing a notification, said system comprising:

a computing device configured for receiving from a content provider a data packet that represents a notification and that includes routing information that includes a broadcast alias that is associated with a list of recipients;

the computing device further configured for parsing the received data packet;

the computing device further configured for validating the content provider identified by the parsed data packet, the validated content provider having been previously digitally signed and certified by some entity;

the computing device further configured for accessing the list of recipients associated with the broadcast alias obtained from the parsed data packet; and

the computing device further configured for delivering, in response to the receiving, the parsing, the validating, and the accessing, the received data packet to a plurality of recipients indicated by the accessed list of recipients associated with the broadcast alias obtained from the parsed data packet.

2. The system of claim **1**, wherein the computing device comprises a master router and a plurality of worker routers, said master router configured to associate the notification with one of the plurality of worker routers.

3. The system of claim **1**, wherein the computing device is coupled to a plurality of databases.

4. The system of claim **1**, further comprising a computer-readable medium having stored thereon a data structure associated with an application programming interface, said data structure comprising:

a broadcast list identifier associated with the broadcast alias; and

a list of users associated with the broadcast list identifier.

5. The system of claim **4**, further comprising a broadcast list table configured to associate the broadcast list identifier with a member table, said member table configured to store the list of users associated with the broadcast list identifier.

6. The system of claim **1**, wherein the delivering is based on user routing preferences.

7. The system of claim **1**, the computing device further configured for delivering the received data packet by sending the received data packet to a third-party gateway that is configured to deliver the received data packet to each of the plurality of recipients indicated by the accessed list of recipients associated with the broadcast alias obtained from the parsed data packet.

8. A method for processing a notification, said method comprising:

receiving, by a computing device from a content provider, a data packet that represents a notification and that includes routing information that includes a broadcast alias that is associated with a list of recipients, the computing device coupled to the content provider via a data communication network;

parsing the received data packet;

validating the content provider identified by the parsed data packet, the validated content provider having been previously digitally signed and certified by some entity;

accessing, by the computing device, the list of recipients associated with the broadcast alias obtained from the parsed data packet; and

delivering, by the computing device in response to the receiving, the parsing, the validating, and the accessing, the received data packet to a plurality of recipients indicated by the accessed list of recipients associated with the broadcast alias obtained from the parsed data packet.

9. The method of claim **8**, further comprising populating an activity queue with the received data packet.

10. The method of claim **9**, further comprising accessing the activity queue to obtain the stored data packet.

11. The method of claim **8**, wherein the accessing the list of recipients comprises:

retrieving, based on the broadcast alias, a broadcast list identifier from a broadcast list table; and

identifying one or more recipients associated with the broadcast list identifier by accessing a member list table, said one or more recipients indicated by the list of recipients.

12. The method of claim **8**, wherein delivering the received data packet comprises sending the received data packet and the accessed list of recipients to a third-party gateway configured for delivering the received data packet to each of the plurality of recipients indicated by the accessed list of recipients associated with the broadcast alias.

13. The method of claim **8**, wherein delivering the received data packet to the plurality of recipients indicated by the accessed list of recipients comprises delivering the received data packet to computing devices associated with each of the plurality of recipients indicated by the accessed list of recipients associated with the broadcast alias.

14. The method of claim **13**, wherein the computing devices include one or more of the following: a cellular telephone, a pager, a handheld computing device, and a smart personal object.

15. The method of claim **8**, wherein delivering the received data packet comprises delivering the received data packet via one or more transport mediums.

16. The method of claim 15, wherein the transport mediums include one or more of the following: electronic mail, instant messaging, and mobile short-message-service messaging.

17. At least one computer storage device storing computer-executable instructions that, when executed by a computing device, cause the computing device computer to perform a method for processing a notification, said method comprising:

receiving a data packet that represents notification and that includes routing information that includes a broadcast alias that is associated with a list of recipients;

parsing the received data packet;

validating the content provider identified by the parsed data packet, the validated content provider having been previously digitally signed and certified by some entity;

determining, based on the broadcast alias, a list of recipients associated with the broadcast alias obtained from the parsed data packet; and

delivering, in response to the receiving, the parsing, the validating, and the determining, the received data packet to a plurality of recipients identified by the determined list of recipients associated with the broadcast alias obtained from the parsed data packet.

18. The at least one computer device media of claim 17, the determining further comprises retrieving, based on the broadcast alias, a broadcast list identifier from a broadcast list table and identifying one or more recipients associated with the broadcast list identifier by accessing a member list table, said one or more recipients comprised by the list of recipients.

19. The computer storage device of claim 17, wherein the data packet includes time-sensitive content.

* * * * *